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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Lightweight Metal Construction Framing Components

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(73) Same as inventor

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Canada

A B S T R A C T

A system of construction components formed out of sheet metal includes a truss, a bridging truss and various embodiments of the spacer plates for joists, studs and roof trusses. The components are adapted to be used in conjunction with other metal components or conventional wood components, and provide a lightweight alternative to lumber which reduces labour costs and facilitates retaining the integrity of the structure throughout the installation of services.

Field of Invention

This invention relates to construction components. In particular, this invention relates to a system of sheet metal components for replacing wood or light duty metal framing components in construction applications.

Background of the Invention

Wood is still the preferred material for use in framing most light duty construction projects, such as residential and small commercial structures. Wood is widely available and versatile in terms of sizing, however it presents a number of disadvantages in construction applications.

Wood is heavy and cumbersome, and the erection of a wooden frame for any sizable project is a very labour-intensive task. Thus, since the cost of labour generally accounts for the largest portion of construction costs, wood frame structures are relatively expensive to build. The framing of a wood frame structure does not take into account services which will be installed in the structure after the rough frame has been erected, such as electrical, plumbing and heating services, which require considerable drilling through and in some cases removal of wooden components. Moreover, because wood comes from living organisms, and due to widespread outdoor storage where it is exposed to the elements, construction lumber can warp unpredictably, making it very difficult to build surfaces that remain straight and flat.

The present invention overcomes these disadvantages by providing a system of construction components formed out of sheet metal. The construction components of the present invention are sufficiently strong to meet building code requirements, yet are

lightweight and inexpensive. These components will not warp or crack over time, and settling of the completed structure is minimal and occurs very quickly. The components are designed to minimize labour costs, and are adapted to facilitate the subsequent installation of services without requiring drilling through or removal of structural components.

The components of the present invention are adapted for use with conventional finishing components, and can be intermixed with wood framing components as desired.

The present invention thus provides a metal truss for use as a construction component comprising a truss plate having a longitudinally extending series of holes, each hole having a swaged rim, and longitudinal edges each comprising a lip extending from the truss plate for securing other construction components thereto.

The present invention further provides a metal bridging truss for bridging construction components, comprising a truss plate having a large central hole and a series of smaller holes, each hole having a swaged rim, a lip extending from each longitudinal edge of the truss plate and substantially perpendicular thereto, and nailing tabs extending from each end of each lip beyond the transverse edges of the truss plate.

The present invention further provides a spacer plate for securing construction components, comprising a main plate having a pair of longitudinal edges, pairs of nailing tabs longitudinally spaced at predetermined intervals, extending substantially perpendicular to the main plate and transversely across a portion thereof, and a planar flange depending from each longitudinal edge

oriented in a direction opposite the direction of the nailing tabs.

Brief Description of the Drawings

In drawings which illustrate by way of example only a preferred embodiment of the present invention,

Figure 1 is a perspective view of a supporting truss embodying the invention;

Figure 2 is a cross-section of the truss of Figure 1;

Figure 3a is a cross-section of a further embodiment of the supporting truss;

Figure 3b is a cross-section of a still further embodiment of the supporting truss;

Figure 4 is a perspective view of a bridging truss embodying the present invention;

Figure 5 is a perspective view of the bridging truss taken opposite Figure 4;

Figure 6 is a partially cut away perspective view of a spacer plate embodying the invention;

Figure 7 is a cross-section of a further embodiment of the spacer plate;

Figure 8 is a perspective view of a further embodiment of the spacer plate for use as a joist hanger;

Figure 9 is a cross-section of the spacer plate of Figure 8;

Figure 10 is a perspective view of a truss cap;

Figure 11a is a perspective view of a spacer plate embodying a modification of the nailing tabs; and

Figure 11b is a front elevation of the spacer plate of Figure 11a showing the spacer tabs after bending.

Detailed Description of the Invention

The present invention provides a construction system comprising the following components: supporting truss components for joists, studs and roof trusses; joist, stud and roof truss spacers; joist hangers; bridging members; and roof truss caps.

All components are preferably stamped from suitable gauge sheet metal, such as galvanized steel, and are secured together using self-tapping screws or nails. Finishing components are similarly affixed to the metal frame components using self-tapping screws, and the metal frame components can be conventionally affixed to wood frame components using nails or screws.

Figure 1 illustrates a supporting truss 10 embodying the present invention, for use as a joist, stud or roof truss and dimensioned accordingly. The truss 10 is provided with a series of large openings 12 extending longitudinally along the truss plate 14, separated by transverse reinforcing embossments 16 extending transversely across most of the truss plate 14. Each large opening 12 is of a diameter which is not more than one half of the transverse dimension of the truss 10, and is preferably surrounded by a series of smaller holes 18, preferably 3/4 inch in diameter to allow for electrical and plumbing services to be passed therethrough. The margins of both the large holes 12 and the small holes 18

are swaged to form reinforcing rims, as seen in cross-section in Figures 2 and 3.

Each longitudinal edge of the truss is provided with a lip 20. In a first embodiment, illustrated in Figure 2, the lip 20 is curled to form a generally triangular crown 22 preferably 1 1/2 inches in width to conform to current lumber standards. The outer face 24 of the crown 22 is generally perpendicular to the truss plate 12 and is preferably recessed slightly along its longitudinal centre, to guide securing screws 2 toward the centre of the crown 22. In a further embodiment, illustrated in Figure 3a, the lip 20 is planar and perpendicular to the truss plate 12, and is fitted with a wood block 26 of standard dimensions in order to provide a nailing surface along the crown of the truss 10. In a still further embodiment, illustrated in Figure 3b, the lip 20 is provided with a return flange 25 surrounding the wood block 26 in snug-fit relation. Where desired, a cap (not shown) may be fitted to the ends of the truss to provide reinforcement and cleanly finished ends.

A bridging truss 30 according to the present invention is illustrated in Figures 4 and 5. The bridging truss 30 is provided with a truss plate 32 having a large central opening 34 surrounded by a series of smaller holes 36, each being swaged for reinforcement. Each edge of the truss plate is provided with a planar orthogonal lip 38 having nailing tabs 40 extending from each end beyond the transverse edges of the truss plate 32. The lip 38 may be scored at its junction with each tab 40, to permit the tabs 40 to be manually bent inwardly toward the truss plate 32 where the edge of the joist 6 is not accessible, for example in re-bridging an existing floor. The bridge 30 may optionally include flanges 42 extending orthogonally from the truss plate 32

for nailing or otherwise securing the bridge 30 to the side of a joist 6.

To secure the bridging truss 30 to, for example, metal or wood joists 6 in a floor under construction, the bridging truss 30 is placed between the joists 6 and set perpendicular thereto, with the nailing tabs 40 above and below the joist 6 at each end. Nails or screws (not shown) are then driven through the tabs 40 into the wooden or metal edges of the joist 6. In a retrofit situation, for example when installing bridging trusses 30 into an existing wooden floor, the nailing tabs 40 are bent inwardly toward the truss plate 32 until they are perpendicular to the lips 38, and screws or nails are then driven through the tabs 40 and/or the flanges 42 into the sides of the joists 6.

The bridging trusses 30 are dimensioned to the width of the joists 6 and the spacing between the joists 6, again preferably such that the central opening 34 does not extend beyond the central half of the truss plate 32. Each bridging truss 30 effectively acts as a pair of cross-bridges joined laterally end-to-end , and it will thus be apparent that services such as electrical wiring 4 and water supply pipes 5 can be passed through the smaller openings 36, while large conduits such as drainage pipes and heating ducts (not shown) can be passed through the central opening 34 without the need to drill or remove the bridging truss 30, saving significant labour costs and maintaining the structural integrity of the floor. When the bridging trusses 30 are used to bridge the metal supporting trusses illustrated in Figures 1-3, the installation of services is greatly facilitated, with positioning and location of conduits being extremely versatile.

A spacer plate 50 is illustrated in Figure 6. The spacer plate 50 comprises a main plate 52 having pairs of nailing tabs 54 extending perpendicular thereto at the desired intervals, for example at 16 inches on centre. Preferably the nailing tabs 54 are die-stamped out of the main plate 52, but separate tabs may be welded or otherwise affixed thereto. In one embodiment the spacer plate 50 is affixed atop a sill plate or shoe, or a wooden beam 8, to secure joists or studs 6, and the main plate 52 is dimensioned accordingly. Side flanges 56 assist in proper seating and lateral bracing of the spacer plate 50, and may be provided with nailing holes 58. For steel I-beam 9 applications the side flanges 56 may be provided with cut-out tabs 60 which can be manually folded under the top of the beam as at 61 to prevent uplifting.

A spacer plate 50 for roof trusses is illustrated in cross-section in Figure 7. The main plate 52 is seated atop the top plate 62 of the wall frame, as in the other spacer plate embodiments, however the side flanges 56 extend down past the top plate 62 for nailing directly into the wall studs 64, preferably through nailing holes pre-drilled in the appropriate positions to avoid a workman nailing the plate 50 into the top plate 62 of the wall frame. This configuration resists "uplift", which occurs in windy environments where wind causes the top plate 62 to separate from the tops of the wall studs 64, resulting in draughts and, in extreme cases, roof collapse.

In each of these spacer plate embodiments, the joists, studs or roof trusses are automatically spaced to the desired intervals using the nailing tabs 54 as a guide, saving significant labour costs. A snug fit reduces draughts and transmission of heat and cold. Furthermore, since the spacer plates are supported

underneath by structural members, and thus do not bear any weight themselves, large portions of the main plate 52 can be cut away, as at 66, resulting in a very lightweight component with no loss in utility and reduced conduction of heat and cold. However, the main plate 52 should not be cut away to the point where the spacer plate 50 cannot be carried without buckling.

A variation of the joist spacer plate 70, illustrated in Figure 8, also serves as a joist hanger. In this embodiment one of the side flanges 72 is directed opposite to the other side flange 74, as seen in cross-section in Figure 9. The side flange 74 oriented in the same direction as the nailing tabs 76 forms a levelling guide for the ends of the joists 6. The other side flange 72 rests on a header plate or ribbon 7. This embodiment thus provides a guide for both the spacing and the levelling of the joists 6, while providing some measure of vertical support; as such, any cutouts 78 should not extend beyond the central half of the main plate 74. The flange 72 can be omitted to simplify manufacture and reduce weight and material costs.

A further embodiment of the spacer plate is found in the truss cap 80 illustrated in Figure 10. In this embodiment the main plate 82 is bent along its longitudinal centre, to a degree corresponding to the pitch of the roof. Preferably pairs of nailing tabs 84 are provided on one side of the centre line and corresponding nailing holes aligned with the nailing tabs are provided on at least the other side of the centre line, preferably on both sides. The roof trusses 9 are thus readily spaced at the desired interval and secured by screws or nails. The truss 80 also provides a bearing at the ridge of the roof for roof sheathing.

A variation of the spacer plate, illustrated in Figures 11a and 11b using the joist hanger embodiment 70 as an example, has the nailing tabs 76 struck from the main plate 71 from a common point. Rather than each nailing tab 76 being separately die-stamped and struck to the perpendicular, the embodiment of Figures 11a and 11b has pairs of opposing nailing tabs 76 separated by an undulating centre line, and then struck simultaneously to be perpendicular to the main plate 71. This configuration simplifies the manufacture of the spacer plate 70 and allows nails to be located further from the end of the joist 6, for greater strength.

The invention having been thus described by way of examples of the preferred embodiments, it will be obvious to those skilled in the art that certain modifications and adaptations may be made to the various components of the system without departing from the scope of invention as set out in the claims appended hereto.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A metal truss for use as a construction component comprising

a truss plate having a longitudinally extending series of openings, and

longitudinal edges each comprising a lip extending from the truss plate for securing other construction components thereto.

2. A truss as defined in claim 1 wherein each opening has a swaged rim.

3. A truss as defined in claim 2 wherein each lip is curled to form in cross-section a generally triangular crown having an outer face substantially perpendicular to the truss plate.

4. A truss as defined in claim 3 wherein the outer face of the crown includes a generally central longitudinal recess.

5. A truss as defined in claim 2 wherein each lip is planar and substantially perpendicular to the truss plate, and includes a wooden block affixed thereto.

6. A truss as defined in claim 5 wherein the wooden block extends substantially the length of the lip.

7. A truss as defined in claim 1 including nailing tabs longitudinally spaced at preselected intervals, extending substantially perpendicular to the truss plate and transversely across a portion thereof.

8. A truss as defined in claim 7 wherein the nailing tabs are integral with the truss plate.

9. A truss as defined in claim 7 wherein the lips are planar and substantially perpendicular to the truss plate, one of the lips being oriented in the same direction as the nailing tabs and the other of the lips being oriented in the opposite direction.

10. A metal bridging truss for bridging construction components, comprising

a truss plate having a large central hole and a series of smaller holes, each hole having a swaged rim,

a lip extending from each longitudinal edge of the truss plate and substantially perpendicular thereto, and

nailing tabs extending from each end of each lip beyond the transverse edges of the truss plate.

11. A bridging truss as defined in claim 10 wherein the junction between the lips and the nailing tabs is scored.

12. A spacer plate for securing construction components, comprising

a main plate having a pair of longitudinal edges, and

pairs of nailing tabs longitudinally spaced at predetermined intervals, extending substantially perpendicular to the main plate and transversely across a portion thereof.

13. A spacer plate as defined in claim 12 having a planar lip depending from each longitudinal edge oriented in a direction opposite the direction of the nailing tabs.

14. A spacer plate as defined in claim 13, wherein the flanges include cut-out tabs for banding manually

toward the main plate to secure the spacer plate to a metal I-beam.

15. A spacer plate as defined in claim 13, for seating on top of the top plate of a supporting wall to secure roof trusses, wherein the flanges extend beyond the top plate for nailing to wall studs.

16. A spacer plate as defined in claim 15 wherein nailing holes are disposed longitudinally along the flanges at preselected intervals, at a distance from the main plate greater than the depth of the top plate.

17. A spacer plate as defined in claim 12 for use as a truss cap, wherein the main plate is bent along its longitudinal centre in the direction of the nailing tabs to a preselected angle, the nailing tabs extending transversely across a portion of the main plate on one side of the centre line only, and nailing holes being provided at the preselected intervals through a portion of the main plate on the other side of the centre line in alignment with the nailing tabs.

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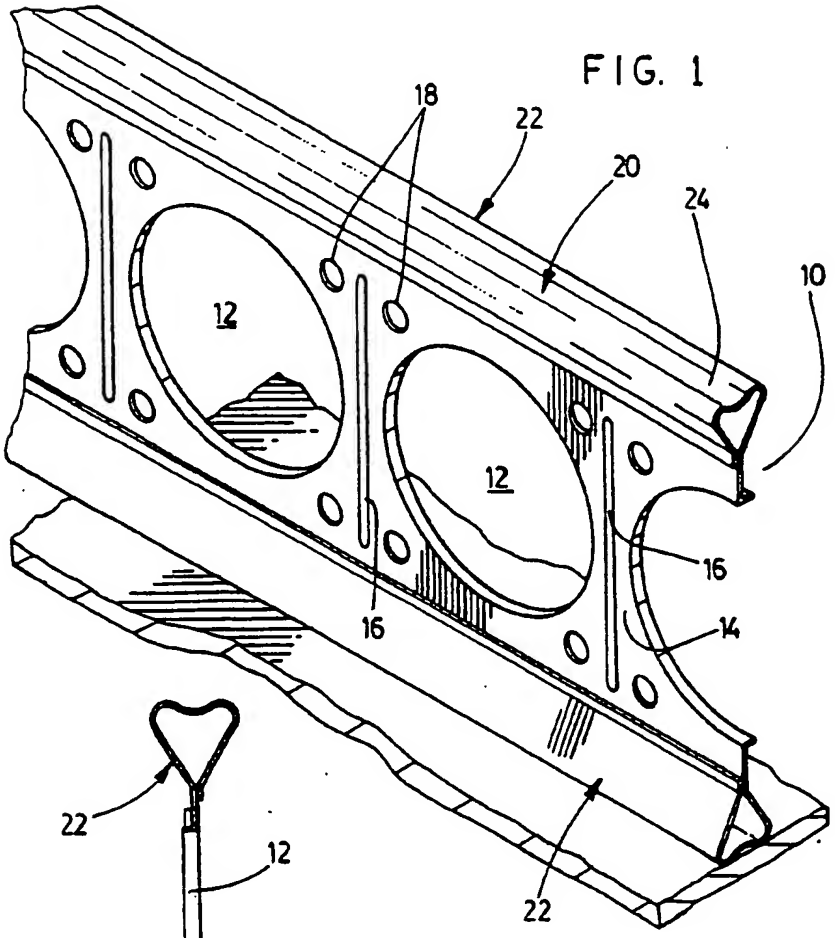
FIG. 1



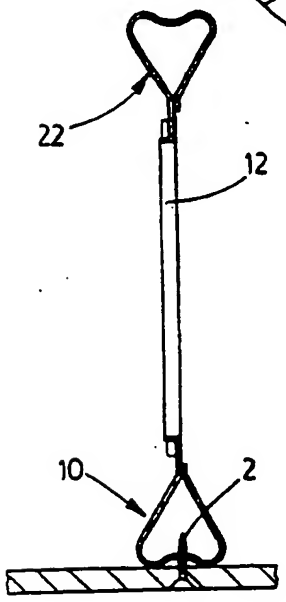


FIG. 2

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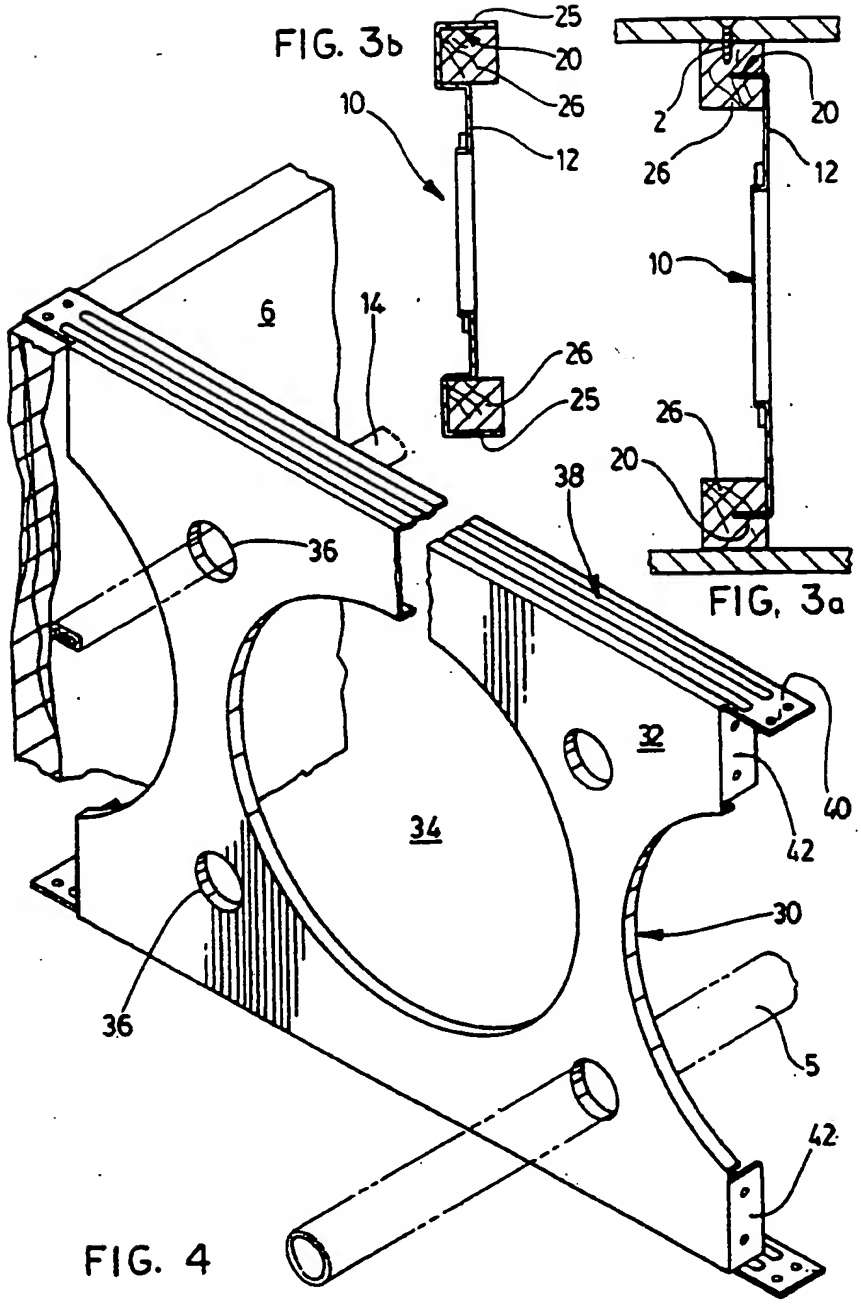

FIG. 3b

FIG. 3a

FIG. 4

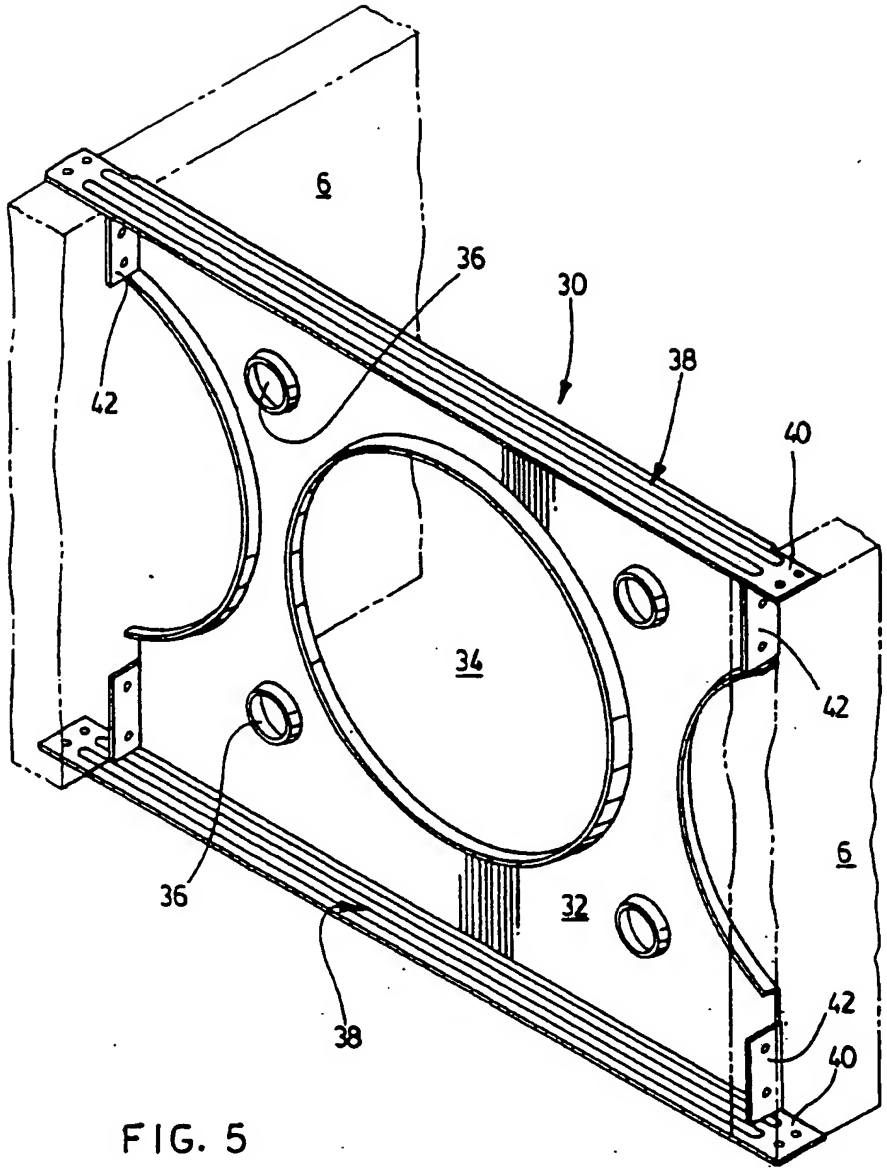

FIG. 5

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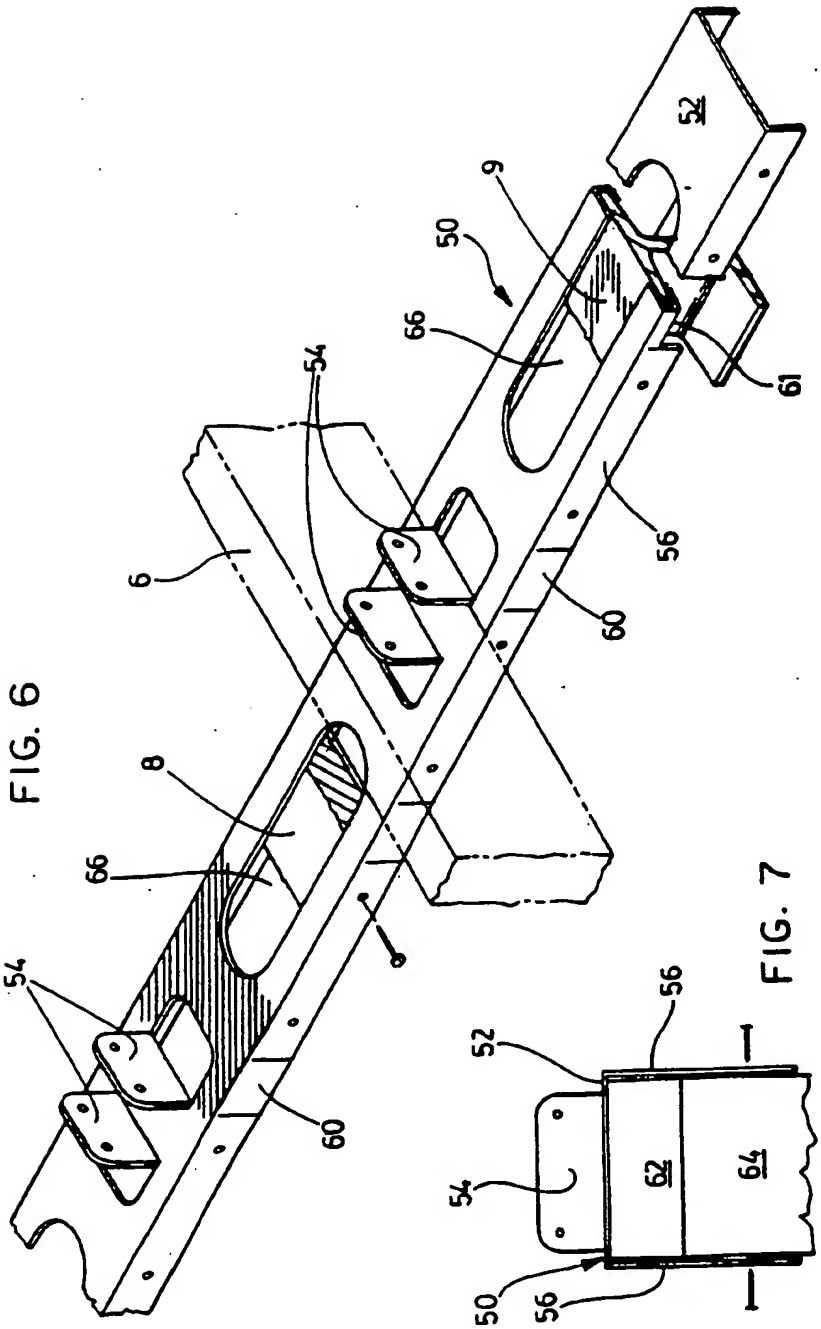

FIG. 6

FIG. 7

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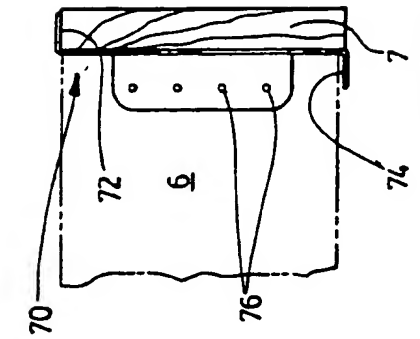

FIG. 9

FIG. 8

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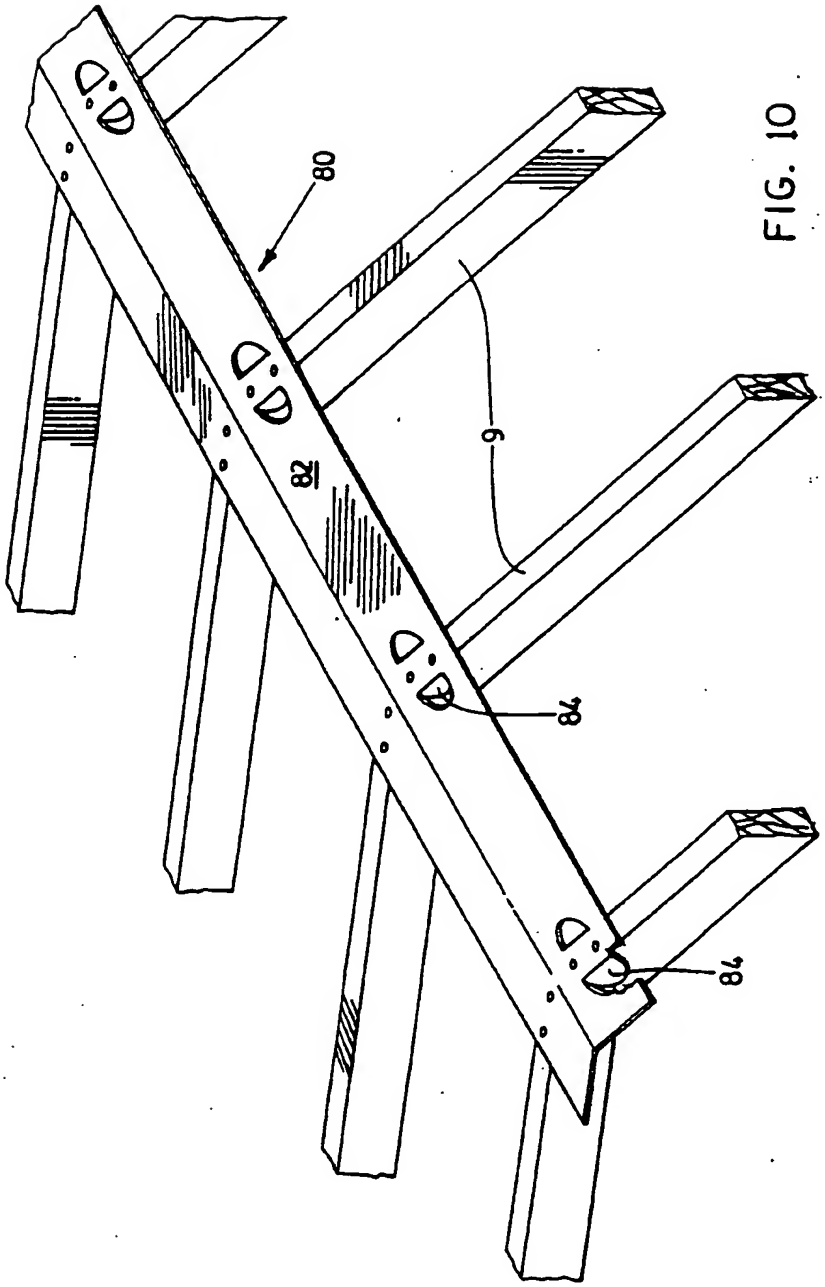

FIG. 10

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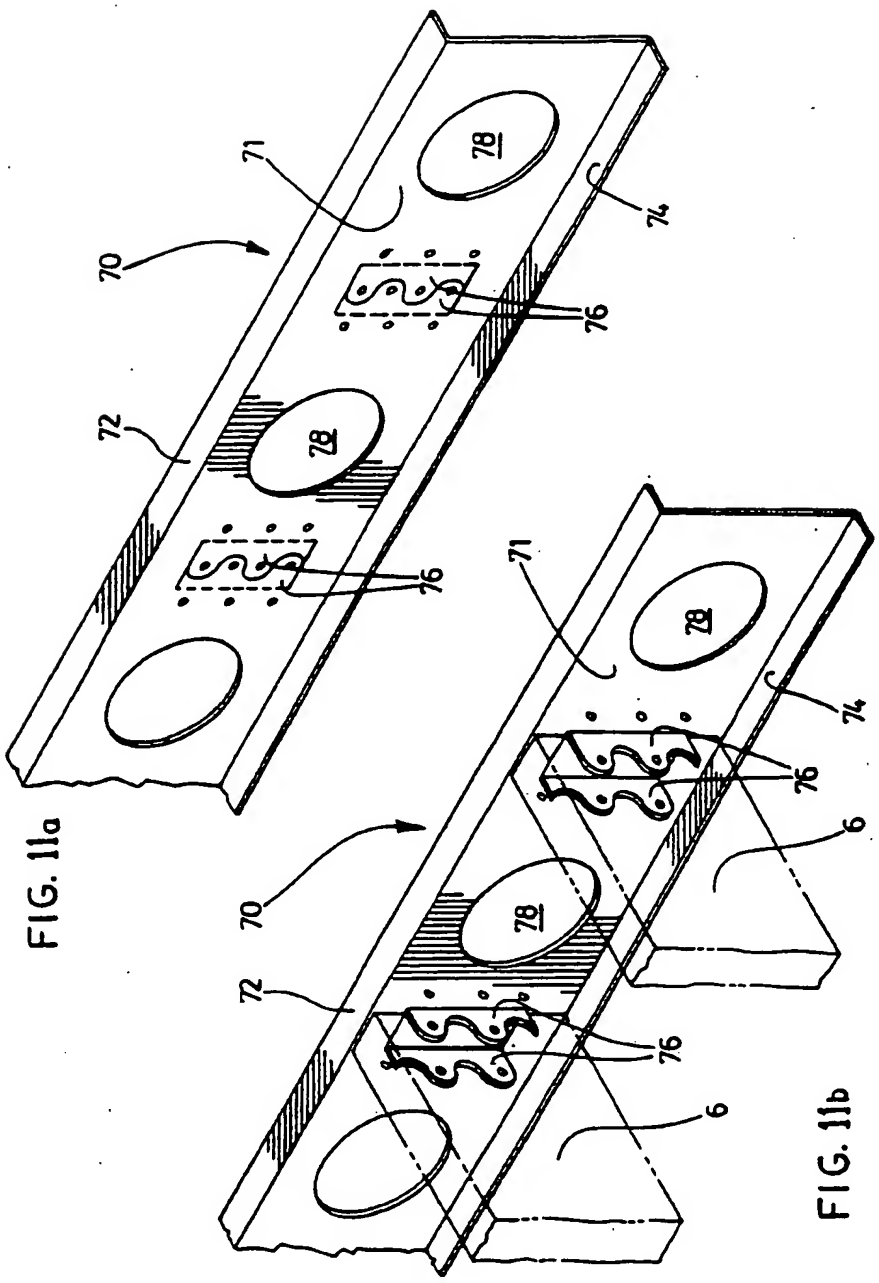

FIG. 11a

FIG. 11b

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